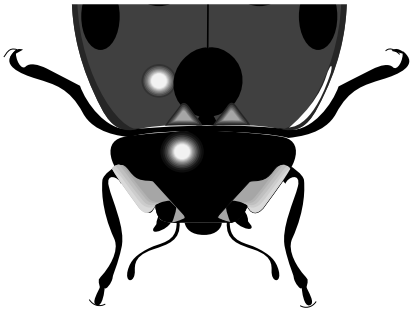

PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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Also in This Issue

First Issue for 2003

No one can say that the waning winter of 2002–2003 was a repeat of the previous winter. After a string of mild winters, the winter of 2002–2003 was more like what we expect of winters in the Midwest—plenty of snow and cold temperatures. As I write this article, winter is just beginning to lose its grip on us, so it's unlikely that fieldwork will begin right away. However, the tillage tools and planters will be in the fields soon enough, and shortly thereafter, the pest management and crop development fun begins!

As has been our tradition, the first issue of the *Bulletin* comes out in mid-March, just to get our juices flowing; then we give it a rest for a week, so we can build momentum. Starting with the next issue of the *Bulletin* (issue no. 2, April 4), we will publish weekly issues through mid-August, with a team of Extension specialists and educators writing articles to keep you informed of pest situations and crop development throughout the state. You'll read all of the familiar names—Gray, Hager, Hoeft, Malvick, Nafziger, Niblack, Sprague, Steffey—in bylines for the various articles. And you'll read some new names, too. Please allow me to introduce some new members of our team.

Kelly Cook, Extension IPM specialist in entomology, began working with the Extension entomology group in February 2003, after completing her M.S. degree with Dr. Rick Weinzierl, Department of Crop Sciences, University of Illinois. Her research focused on corn flea beetles, Stewart's wilt, and sweet corn. Dawn Nordby, Extension IPM specialist in weed science, began working with the Extension weed science group in March 2003. Dawn recently earned her M.S. degree with Dr. Robert Hartzler, Department of Agronomy at Iowa State University. Her research focused on the population dynamics of waterhemp in corn. Ron Estes became coordinator for the Insect Management and Insecticide Evaluation program in September 2002. Ron worked for 1-1/2 years with Drs. David Voegtlin (Illinois Natural History Survey) and David Onstad (Department of Natural Resources and Environmental Sciences), who led research on soybean aphids in Illinois. Although Ron probably won't contribute many articles, you'll read his name frequently in the *Bulletin*.When you get an opportunity, please introduce yourself to our new staff, and don't hesitate to contact them for information.

I won't belabor the next point—don't hesitate to contact us with reports from anywhere in Illinois or elsewhere. We greatly appreciate the reports, and we liberally use the information. Enough said. (And thanks very much in advance.)

On behalf of all of the authors who contribute to the *Bulletin*, I thank you for your continued support of our efforts and your interest in the information we provide. We look forward to working with you and providing the most current and useful information possible. Here's wishing you an enjoyable and profitable season.—*Kevin Steffey*

INSECTS

Transgenic Corn Rootworm Hybrids: A Promising IPM Tool, Yet Important Concerns Linger

On February 25, 2003, Monsanto Company announced it had received a registration from the U.S. Environmental Protection Agency for the sale of its YieldGard Rootworm–protected corn. The USDA and the Food and Drug

Administration had previously finished their reviews of this transgenic event (MON 863, Cry3Bb1). This completed the regulatory review process for both the United States and Japan. The current registration is for 1 year; however, Monsanto Company anticipates extending this registration for several more years. For this planting season, YieldGard Rootworm hybrids will be available through Monsanto's seed businesses (DeKalb and Asgrow) and also will include licensed independent seed companies. The following twelve North Central states have granted approvals for the sale of YieldGard Rootworm hybrids: Illinois (2/26/03), Indiana (2/25/03), Iowa (3/03/03), Kansas (3/04/03), Kentucky (2/26/03), Michigan (3/07/03), Missouri (2/26/03), Nebraska (2/26/03), North Dakota (3/10/03), Ohio (3/06/03), South Dakota (2/26/03), and Wisconsin (3/07/03).

Similarly to other unapproved transgenic crops in Europe, YieldGard Rootworm grain and/or processed products will need to be channeled away from other grain intended for shipment to customers in Europe. Serious concerns have been raised by several key farm organizations regarding the potential erosion of the important U.S. corn gluten export market because of continuing European concerns about this technology. On November 11, 2002, the Illinois Corn Growers Association devoted a full one-page notice *(FarmWeek)* to Illinois corn producers explaining potential producer benefits and losses regarding the adoption of YieldGard Rootworm hybrids. In this article, the Illinois Corn Growers Association offered a sobering statement: "Due to the high percentage of Illinois corn going into the corn wet mill industry, it is extremely likely the corn refining industry will not be able to deliver a corn gluten feed product that meets the 1% tolerance of European customers." They also pointed out that Illinois and Iowa account for roughly 67% of the corn gluten feed in the United States. Because of the importance of the corn gluten export market for U.S. corn producers (particularly Illinois and Iowa producers), the Illinois Farm Bureau Board of Directors (November 2002) has urged producers not to plant corn hybrids unless they are approved for the European Union or other major markets.

In spite of these important concerns, a Scientific Advisory Panel that met in Arlington, Virginia, during August 28 and 29, 2002, to offer advice and counsel to the U.S. EPA as part of the registration process as outlined by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), outlined several important benefits to producers who choose to use YieldGard Rootworm hybrids: "(1) equivalent to or better than soil insecticides in terms of plant damage; (2) reduced applicator, handler, and farmer worker exposure to insecticides; (3) a narrow spectrum of activity could possibly eliminate or greatly reduce the environmental concerns generated by broader spectrum insecticides; (4) the technology is easy to use and does not delay planting; (5) the technology does not require special application equipment, the need for calibration, or the disposal/return of containers; and (5) performance consistency is improved since each plant is protected and this protection is relatively unaffected by weather." The panel was divided regarding the most appropriate resistance management plan to recommend to the U.S. EPA for implementation by American producers. Some panel members urged the EPA to recommend a 50% refuge; other members believed that a 20% refuge was more reasonable and would accomplish the goal of prolonging the usefulness of this technology. The North Central Region Technical Research Committee on Corn Rootworms and Soil Insects (NCR-46) recommended to the EPA that a 20% refuge should be utilized.

Because of important biological differences between corn rootworms (mating is much more localized, less mixing of adults from different fields) and European corn borers, the resistance management plan for YieldGard Rootworm hybrids has some unique features and includes the following elements: (1) growers will be required to sign stewardship agreements if they purchase YieldGard Rootworm hybrids; (2) growers will be required to plant a structured refuge of at least 20% non-Cry3Bb1 (MON 863) Bt corn; (3) the refuge may be treated with insecticides to control corn rootworm larvae; (4) refuge acres should be planted as blocks *adjacent* to MON 863 cornfields or as *in-field strips;* (5) refuges planted as strips must be at least six rows wide, preferably 12 consecutive rows wide; and (6) insecticides labeled for control of corn rootworm adults cannot be applied while adults are present in the refuge unless the YieldGard Rootworm field is treated in a similar manner. This last guideline (number 6) will no doubt be debated among entomologists regarding its "fit" within the IPM paradigm.

Growers who plant YieldGard Rootworm hybrids should anticipate finding adult corn rootworms in their YieldGard Rootworm fields. These adults will include immigrants as well as those that have emerged directly from YieldGard Rootworm fields. Results from University of Illinois experiments that were conducted in 2001 indicated that more than 27,000 western corn rootworm adults (males and females) per acre were capable of emerging from a MON 863 hybrid. Finding this many western corn rootworm adults may surprise some growers who are familiar with the highly lethal effect of Bt hybrids used for European corn borers. Although the YieldGard Rootworm hybrids do protect root systems very effectively against larval injury, they are low to moderate in their expression of the Cry3Bb1 protein. In fact, the Scientific Advisory Panel that met to discuss this technology made the following observation: ". . . the use of *SS* (homozygous susceptible) survival rates was sufficient to demonstrate that MON 863 is not high dose, because *SS* survival is so much higher than that expected at 25H the LC99

(lethal concentration to 99% of a population)." Registration of future corn rootworm events may be higher dose, and entomologists, ecologists, and modelers will have to decide if one resistance management plan "fits all" for this insect pest.

All YieldGard Rootworm hybrids will be treated with Gaucho (imidacloprid, 0.16 milligrams of active ingredient per kernel) in an effort to achieve control of some secondary insect pests such as wireworms and seedcorn maggots. With respect to the use of soil insecticides and seed treatments, the panel offered the following cautionary statement: "It was the consensus of the Panel that soil insecticides and seed treatments targeted toward corn rootworms could be used in the refuge if significant numbers of adult beetles are still produced. This is the case with currently registered soil insecticides. However, if a highly efficacious insecticide that prevented significant adult emergence were to be used, this could have a major detrimental effect on IRM." We intend to conduct investigations over time regarding the influence of seed treatments on adult emergence patterns of western and northern corn rootworms. For additional information on the Scientific Advisory Panel recommendations regarding the use of transgenic hybrids for corn rootworms, please visit the following Web site: http://www.epa.gov/scipoly/sap/index.htm#august.

Because the great majority of producers have made their seed selection decisions and the availability of YieldGard Rootworm hybrids will be limited in 2003, soil insecticide use will remain very high on continuous and rotated corn acres in many areas of the Corn Belt. With crop rotation not performing adequately as a pest management tool for western corn rootworms in the eastern Corn Belt and resistance to methyl-parathion and carbaryl confirmed in Nebraska, producers are eager to utilize a new pest management tool for this significant insect pest. We suspect that interest in this transgenic technology will continue to grow. Unlike the use of transgenic insecticidal cultivars for European corn borer management, the use of transgenic hybrids for corn rootworms could work in concert with existing scouting programs and established economic thresholds. By monitoring their fields for corn rootworm adults in late summer, farmers could base their decision to use transgenic rootworm hybrids the following spring on scouting input and knowledge of thresholds. Crop consultants and other professionals in the agribusiness sector could take a very active role in this decision-making process.—*Mike Gray and Kevin Steffey*

Control of Soil-Inhabiting Insect Pests of Corn

For 2003, producers have many options for controlling soil-inhabiting insect pests of corn. The registration of liquid insecticides and insecticidal seed treatments has broadened the arsenal, and the more recent registration of YieldGard Rootworm corn (Monsanto's event MON 863 with the Bt Cry3Bb1 protein) has added yet another dimension to soil insect control in corn. (For more details, read the article about YieldGard Rootworm corn in this issue of the *Bulletin.)* With so many options available, an overview is in order.

Granular and liquid insecticides and insecticidal seed treatments currently labeled for control of corn rootworm larvae, cutworms, white grubs, and wireworms in Illinois are presented in Table 1. Note that all labels are not acknowledged for control. If a product label contains wording such as "suppression," "will aid in control of," or "reduces feeding" for any given insect, we have not acknowledged control in the table. For more information about a product (e.g., rate of application, placement, timing of application), read the label. You also can refer to Chapter 1, "Insect Pest Management for Field and Forage Crops," in the 2003 *Illinois Agricultural Pest Management Handbook.*

To limit the complexity of Table 1, we did not include other secondary soil-inhabiting insect pests of corn, such as grape colaspis, seedcorn beetles, and seedcorn maggot. Nor did we include insect pests that feed on corn seedlings above ground early in the season—billbugs, corn flea beetles, and southern corn leaf beetle. The latter usually can be controlled effectively with foliar-applied insecticides if scouting suggests that the insects are causing sufficient damage to warrant control. Nevertheless, several of the products listed in Table 1 include some of the aforementioned insects (both soil-inhabiting and aboveground insects) on their labels.

Some of the products in Table 1 are systemic (i.e., absorbed by treated plants and translocated from the site of uptake to other tissues). Such products *may* control both soil-inhabiting and aboveground insects early in the season. Insecticides with systemic activity include Counter, Cruiser, Gaucho, Prescribe, Regent, and Thimet. None of the other products listed in Table 1 are systemic.

Insecticidal seed treatments and liquid insecticides have become legitimate alternatives to granular soil insecticides. However, performance of seed treatments and liquid insecticides for control of corn rootworm larvae has not been as consistent as performance of Aztec, Counter, Force, and Lorsban in insecticide efficacy trials conducted in Illinois and Iowa. When infestations of corn rootworm larvae are high, seed treatments and liquid insecticides may not provide acceptable control. Efficacy data for the seed treatments and liquid insecticides against other soil-inhabiting insects in corn are not abundant. Some of the label claims are based on results from only a few research trials. Consequently, the effectiveness of these products against pests such as grape colaspis and white grubs is uncertain.

Remember that not all cornfields are infested with soil-inhabiting insects. Consequently, not all fields need to be

Table 1. Insecticides and insecticidal seed treatments labeled for control of rootworms, cutworms, white grubs, and wireworms in Illinois.

Product	Product formulation	Corn rootworms	Cut-worms	White grubs	Wire-worms
*Ambush 2E	Liquid	—	•	—	—
*Asana XL	Liquid	—	•	—	—
*Aztec 2.1G and 4.67G[a]	Granules	•	•	•	•
*Capture 2E	Liquid	•	•	•	•
*Capture 1.15G	Granules	•	•	•	•
*Counter CR	Granules	•	—	•	•
diazinon + lindane	Seed treatment	—	—	—	•
*Empower	Granules	•	•	•	•
*Force 3G	Granules	•	•	•	•
*Fortress 2.5G and 5G[a]	Granules	•	•	•	•
Gaucho	Seed treatment	—	—	—	•
Lorsban 15G	Granules	•	•	—	—
*Lorsban 4E	Liquid	—	•	•	•
*Mustang Max	Liquid	—	•	—	—
permethrin	Seed treatment	—	—	—	•
*Pounce 1.5G	Granules	—	•	—	•
*Pounce 3.2EC	Liquid	—	•	—	—
Prescribe	Seed treatment	•	—	•	•
ProShield with Force ST	Seed treatment	•	—	•	•
*Regent 4SC	Liquid	•	—	•	•
*Thimet 20G	Granules	•	—	•	•
*Warrior T	Liquid	—	•	—	•

* Use restricted to certified applicators.
—: The most economical rate of application of this insecticide is not labeled for control of this insect, or is labeled only for suppression or aid in control of the insect.
• : The most economical rate of application of this insecticide is labeled for control of this insect. Refer to the label for rate, timing, and placement of application.
[a] Available only in the SMARTBOX, a closed-handling and application system.

treated with a granular or liquid insecticide or an insecticidal seed treatment. Producers should consider such factors as the history of insect pest problems in an area and in specific fields, the previous year's crop, the presence or absence of weeds, and planting time when deciding whether preventive control of soil-inhabiting insects is necessary. If a decision is made to apply a granular or liquid insecticide or an insecticidal seed treatment for control of soil-inhabiting insect pests in corn, determine which one or two pests are the primary targets for control, and decide among the available products accordingly. If you've had time to sort through data from insecticide efficacy trials, you also will have a better feel for which products provide the most consistent control of specific pests.

We intend to conduct numerous insecticide efficacy trials for control of soil-inhabiting insect pests of corn this spring, and we will apprise you of our results after we have evaluated the trials. Please don't hesitate to contact us if you want to tell us about soil-inhabiting insect pests of corn in your area this year. We are interested in learning as much as possible about effective or ineffective control of these pests.—*Kevin Steffey and Mike Gray*

Baiting for Wireworms

At this time of year, we always write an article about anticipating wireworm infestations by placing solar bait stations in suspect fields. Because this procedure has not changed for years, the article is essentially the same this year. You may be tired of reading it, and we get tired of our own redundancy. (As my son has asked, "Isn't that from the Department of Repetitive Redundancy?") So, because past articles are archived on the Web, I refer you to last year's article in the *Bulletin* (issue no. 1, March 22, 2002) to review the procedure for placing bait stations in the soil for detection of wireworms. The only change I would make would be to include two additional products in the table—Capture 1.15G, applied at 3.2 to 8 ounces of product per 1,000 feet of row in a band or in furrow, and Empower, applied at 6.4 to 8 ounces of product per 1,000 linear feet of row in a band, or applied at 3.2 to 8 ounces of product per 1,000 linear feet of row in furrow. Both of these products are restricted for use by certified applicators. Please read the label for more instructions and precautions.—*Kevin Steffey*

First Black Cutworm Moth Capture of the Season

Ron Hines, senior research specialist at the Dixon Springs Agricultural Center, is at it early again this year. Ron placed pheromone traps for armyworm and black cutworm adults at four sites on March 14. He placed two traps (bottomland and upland) at the Dixon Springs Ag Center in Pope County, one trap in Massac County, and one trap in Pulaski County. Ron checked the traps on March 18 and found one black cutworm moth each in the traps in Massac County and Pope County (upland). So black cutworms are beginning their migration northward. However, we won't begin predicting cutting dates until intense captures (nine or more moths captured in a 1- to 2-day period) occur.

A little later this season, Ron will place other insect traps in southern Illinois to monitor activities of corn earworms, European corn borers, fall

armyworms, Japanese beetles, and southwestern corn borers. He will continue to provide commentary regarding these captures in "The Hines Report" on the IPM Web site (www.ipm.uiuc.edu). Begin watching there for weekly updates.—*Kevin Steffey*

Little Activity Expected from Corn Flea Beetles

Following a hot and dry summer with lots of corn flea beetles, cold temperatures descended on Illinois this past winter. As a result, flea beetle survival and the threat of early season Stewart's wilt is expected to be low. *Erwinia stewartii*, the bacterium that causes Stewart's wilt, survives the winter in the gut of the corn flea beetle. Survival of the corn flea beetle is dependent on winter temperatures. Using the average temperature of December, January, and February, the potential of Stewart's wilt can be predicted (Table 2). The average temperature of December, January, and February fluctuates around the temperature for freezing and is easier to understand than the sum of average temperatures for December, January, and February. The average temperature for these 3 months predicts the potential for flea beetle injury and Stewart's wilt.

Stewart's wilt is spread in the spring as corn flea beetles feed on and infect seedling corn plants. The bacterium can spread systemically throughout the plant. Stewart's wilt has two phases: the seedling wilt phase and the leaf blight phase. The seedling wilt stage occurs when seedlings become infected at or before the V5 stage. The growing point is easily infected; eventually the seedling wilts and dies. Infections of older plants usually result in the development of the leaf blight phase of Stewart's wilt. This phase is characterized by long, yellow to chlorotic streaks, with wavy margins along the leaves. Although most commercial field corn hybrids are resistant to Stewart's wilt, the disease is still a concern for susceptible seed corn inbreds and sweet corn hybrids.

Based on the recent winter temperatures from the Midwestern Climate Center, estimates of early season Stewart's wilt are shown in Table 3. Little flea beetle activity is expected throughout much of Illinois. As is typical, a mild winter in southern Illinois has set the stage for the threat of Stewart's wilt. Remember, however, that these are only predictions; numbers of surviving corn flea beetles are not known. More information on the corn flea beetle and Stewart's wilt will follow as the growing season progresses.—*Kelly Cook*

Table 2. Potential Stewart's wilt based on the average temperatures of December, January, and February.

If the average temperature for December, January, and February is:	Early-season wilt will probably be:	Late-season blight will probably be:
Below 27° F	Absent or nearly so	A trace, at most
Between 27° and 30° F	Light	Light to moderate
Between 30° and 33° F	Moderate	Moderate to severe
Above 33° F	Severe	Severe

Table 3. Predictions for potential Stewart's wilt based on temperatures from December 2002 and January and February 2003.

Location	*Avg temp. (°F)*	*Early-season disease potential*
Janesville, WI	21.8	Absent
Des Moines, IA	25.1	Absent
Rockford, IL	23.5	Absent
Mendota, IL	23.3	Absent
Urbana, IL	26.3	Absent
Brownstown, IL	30.9	Moderate
Dixon Springs, IL	34.3	Severe

Keep an Eye Out for Alfalfa Weevils

As spring commences, the first of the field crop insect pests in Illinois begin to make themselves known. Included in this group is the alfalfa weevil. Egg laying takes place in southern Illinois in the fall and continues through April when temperatures are above 40°F. Consequently, the alfalfa weevil overwinters as both eggs and adults. Alfalfa weevils generally become active when temperatures exceed 48°F, usually in late March and April in southern counties. Larvae begin to develop within the eggs, and adults resume egg laying. On hatching, larvae move to the terminal leaves and begin feeding.

Two distinct peaks of larval activity usually occur in southern Illinois, one from fall-deposited eggs and one from spring-deposited eggs. Hatching of overwintering eggs usually occurs when 200 degree-days (above a base temperature of 48°F) accumulate beyond January 1, and we suggest that scouting should begin when 250 to 300 degree-days accumulate. An early peak of third-stage larvae from overwintering eggs occurs after an accumulation of 325 degree-days; a second major peak of third-stage larvae from spring-deposited eggs occurs after an accumulation of 575 degree-days.

When you begin to scout alfalfa fields for alfalfa weevils, look first in areas of the field that might warm up early, such as south-facing slopes and areas of the field with lighter soils. Small first instars should be present in terminal leaves after the accumulation of 300 degree-days. The small, yellowish larvae with black heads feed on these leaves, causing injury resembling pinholes. The injury is not economic because the larvae are too small to cause significant defoliation. It is not until alfalfa weevils grow into third instars that they begin to cause more economic damage by skeletonizing the leaves. Third instars are bright green with a distinct white stripe along the center of the back.

At the time this article was written, accumulated degree-days were not available from the Illinois Climate Network run by the Illinois State Wa-

ter Survey. However, temperatures in January and February were lower in 2003 than they were during the same months in 2002. A rough estimate of degree-day accumulations thus far in 2003 indicates that 200 degree-days have not accumulated yet even in the most southern locations in Illinois. However, as temperatures increase, degree-day accumulations will occur rather quickly. People in areas near Dixon Springs, Belleville, and Carbondale should begin to spot-check for alfalfa weevils soon. Degree-day accumulations in those areas will approach 200 in late March or early April. We will provide actual and projected accumulated degree-days in future issues of the *Bulletin.*

We can often get insight on potential insect occurrences, like the alfalfa weevil, by keeping track of these insects in states to our south (e.g., Kentucky, Oklahoma, southern Missouri). The survival of alfalfa weevil eggs in Oklahoma was not as high this year as it was at this time last year. This past January, egg populations in 11 counties ranged from 49 to 390 alfalfa weevil eggs per square foot. The average was 125. In February, numbers of alfalfa weevil eggs decreased in six counties, from the January sampling date to the February sampling date. Eggs per square foot ranged from 4 to 435. However, the viability of the eggs remained at 80% on average for both sampling periods. (Data were taken from the article "Alfalfa Weevil Egg Populations in 2003," in Oklahoma State University's *Plant Disease and Insect Advisory*, vol. 2, no. 4, March 7, 2003; http://entoplp.okstate.edu/Pddl/advisory.htm).

Look for more information on the alfalfa weevil, population densities, management options, and degree-day accumulations in future issues of the *Bulletin.—Kelly Cook*

New Products for Insect Control

Some new products for insect control have been labeled within the past few months, so you should be aware of them for consideration while developing insect management plans for 2003. Cruiser, another nicotinoid seed treatment, was registered for use on corn late in 2002 and was discussed in *Bulletin* issue no. 24 (November 1, 2002). You also should be aware of some other recently registered products. Following are brief discussions of these new products, in alphabetical order by trade name.

Empower (active ingredient cyfluthrin), a Helena Chemical Company product. This granular pyrethroid insecticide has the same active ingredient as Capture. However, Empower contains Asset Formulation Technology, a root stimulant. Empower can be applied at planting in a band or in the seed furrow for control of corn rootworm larvae (band only), cutworms, seedcorn beetles, seedcorn maggot, white grubs, and wireworms. The application rates are 6.4 to 8 ounces of product per 1,000 feet of row in a band and 3.2 to 8 ounces of product per 1,000 feet of row in the seed furrow. Empower also can be applied to foliage at 3.5 to 8.7 pounds of product per acre for control of first-generation European corn borer, fall armyworm, and southwestern corn borer. We assume that the efficacy of this product is equivalent to the efficacy of Capture. However, we have not seen much efficacy data. We expect to test this product in research trials in 2003.

Herculex I Insect Protection (expresses the Cry1F insecticidal protein), a Dow AgroSciences product. Herculex I products contain a different protein from YieldGard Corn Borer products, which contain the Cry1Ab protein. Herculex I hybrids will compete directly with YieldGard Corn Borer hybrids for control of European and southwestern corn borers. Other pest Lepidoptera controlled by Herculex I include black cutworm, corn earworm (suppression), and fall armyworm. Herculex I and YieldGard Corn Borer are equivalent in their efficacy against European and southwestern corn borers. Herculex I provides control of black cutworms equivalent to insecticides applied at planting time.

Herculex I is fully approved in the United States for food and feed, and full approval was received in Japan in 2002. However, Herculex I currently is not approved for export to Europe. Herculex I will be available commercially in Mycogen Seeds hybrids for the 2003 growing season. The insect resistance management requirements for Herculex I in Illinois are identical to the requirements for YieldGard Corn Borer—minimum of 20% of acres for non-Bt corn refuge, planted within 1/2 mile of fields with Bt corn hybrids.

Mustang Max (active ingredient *zeta*-cypermethrin), an FMC Corporation product. Mustang, a pyrethroid insecticide, was registered for use in a number of crops in time for the 2002 season. The refined-isomer formulation, called Mustang Max, will replace Mustang. Table 4 provides an abridged list of insect pests for which Mustang Max is labeled, with recommended rates of application. Some critical use information is included in the footnotes. Please recognize that the information in this table has been transposed from the label and mistakes during this process are possible. Consequently, you should ultimately refer to the product label for application rates and other specific information about Mustang Max.

As we learn more about these and other new products for insect control, we will offer discussions and/or announcements in future issues of the *Bulletin.—Kevin Steffey*

Table 4. Abridged label information for control of insects in alfalfa, corn, sorghum, soybeans, and wheat with Mustang Max.

Crop	*Insects*	*Rate of application*
Alfalfa[1]	Alfalfa caterpillar, alfalfa weevil, cutworms, meadow spittlebug, potato leafhopper, webworms	2.24–4.0 oz per acre
	Grasshoppers, plant bugs	2.8–4.0 oz per acre
Corn[2]	Cutworms	0.16 fl oz per 1,000 ft of row
	Cutworms	1.28–2.8 oz per acre
	Corn rootworm adults, European corn borer, flea beetles, grasshoppers, hop vine borer, Japanese beetle adults, sap beetles, southern corn leaf beetle, southwestern corn borer, stalk borer, stink bugs, webworms	2.72–4.0 oz per acre
	Armyworm, chinch bug, fall armyworm	3.2–4.0 oz per acre
	Corn earworm	1.76–4.0 oz per acre
Sorghum (grain)[3]	Cutworms, sorghum midge	1.28–4.0 oz per acre
	Corn earworm, webworms	1.76–4.0 oz per acre
	Chinch bug, grasshoppers	3.2–4.0 oz per acre
Soybeans[4]	Cutworms, thistle caterpillar	1.28–4.0 oz per acre
	Bean leaf beetle, blister beetles, corn earworm, green cloverworm, Japanese beetle adults, Mexican bean beetle, potato leafhopper, soybean aphid, woollybear caterpillars	2.8–4.0 oz per acre
	Grasshoppers, loopers, stink bugs	3.2–4.0 oz per acre
Wheat[5]	Armyworm, cereal leaf beetle	1.76–4.0 oz per acre
	Grasshoppers	3.2–4.0 oz per acre

[1] Do not make applications less than 7 days apart. A maximum of 0.025 pound active ingredient per acre may be applied per cutting and a maximum of 0.075 pound active ingredient per acre per season. Applications may be made up to 3 days of cutting or grazing. Do not apply to mixed stands with intentionally grown forage grasses and/or legumes.
[2] The pre-harvest interval (PHI) is 30 days for grain and fodder and 60 days for forage (silage). Do not apply more than 0.10 pound active ingredient per acre per season including at-planting plus foliar applications of Mustang Max.
[3] The PHI is 14 days for grain and stover and 45 days for forage. Do not make applications less than 10 days apart. Do not apply more than 0.125 pound active ingredient per acre per season.
[4] The PHI is 21 days. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. Do not make applications less than 7 days apart. Do not apply more than 0.15 pound active ingredient per acre per season.
[5] The PHI is 14 days for grain, forage, and hay. Do not make applications less than 14 days apart. Do not apply more than 0.125 pound active ingredient per acre per season.

WEEDS

Corrections for the 2003 *Illinois Agronomy Handbook* and *Illinois Agricultural Pest Management Handbook*

In Chapter 16, on page 195, of the new *Illinois Agronomy Handbook*, the use rates for Lumax should range between 2.5 and 3.0 quarts per acre, *not* 2.65 and 3.0 quarts per acre. This correction also should be made to Chapter 2, on page 52, of the *Illinois Agricultural Pest Management Handbook*.—*Christy Sprague*

New Herbicides and Label Changes for 2003

This article is an overview of label changes and recently registered weed control products for use in field crops. Label changes and recently registered products are presented alphabetically by the company that manufactures or distributes the herbicide. Information includes the properties and intended uses of these products. Further information on efficacy against certain weed species can be found in the 2003 *Illinois Agricultural Pest Management Handbook*, the new 23rd edition of the *Illinois Agronomy Handbook*, and the 2002 *University of Illinois Annual Weed Control Research Report*.

BASF Corporation

Distinct 70WDG (active ingredients diflufenzopyr and dicamba). A label change has been made in the rotation restriction for Distinct. A 30-day rotation restriction is required before planting any crop, with the exception of corn. Corn can be replanted 7 days or more after application. Additionally, a registration for popcorn has been received. Rescue applications of Distinct can now be applied with drop nozzles to corn between 24 and 36 inches tall.

Extreme 2.17L (active ingredients imazethapyr and glyphosate). BASF has received a supplemental label for Extreme applications in the fall to control existing vegetation and to provide residual control of winter annual and early spring emerging weeds. Soybean must be planted in the spring after fall Extreme applications. Fall applications of Extreme should be made after harvest and before ground freeze at 3 pints per acre with a nonionic surfactant and nitrogen source.

G-Max Lite 5L (active ingredients dimethenamid-P and atrazine). G-Max Lite is a recently registered premixture containing 2.25 pounds of active ingredient of dimethenamid-P (Outlook) and 2.75 pounds of active ingredient of atrazine. G-Max Lite is a selective preemergence herbicide that controls annual grasses, some annual broadleaf weeds, and sedges in field corn, seed corn, sweet corn, popcorn, and grain sorghum. G-Max Lite is similar to Guardsman Max, with the exception of containing less atrazine. G-Max Lite may be applied up to 45 days before planting (EPP), preplant incorporated (PPI), preemergence (PRE), and early postemergence (EPOS) to corn up to12 inches in height. Split

applications are recommended if G-Max Lite is applied more than 30 days EPP. Application rates range from 2.5 to 3.5 pints per acre, depending on soil texture and soil organic matter content. A typical use rate of 3.0 pints per acre of G-Max Lite is equivalent to applying 18 fluid ounces of Outlook and 1.0 pound of active ingredient of atrazine.

Prowl 3.3EC (active ingredient pendimethalin). The fall-applied label for Prowl before soybean planting has been extended to cover all of Illinois. Prowl may be surface-applied or incorporated in the fall from October 1 to December 31, or until ground freeze. Fall applications of Prowl will not provide season-long weed control.

Raptor 1S (active ingredient imazamox). Raptor, an acetolactate synthase (ALS)-inhibiting herbicide, has recently received registration for use in alfalfa. Raptor should be applied early postemergence before annual broadleaf and grass weeds exceed 3 inches in height. Use rates range between 4 and 6 fluid ounces per acre for seedling or established alfalfa grown for forage, hay, or seed. There should be at least 20 days between Raptor application and cutting or feeding alfalfa for forage or hay, and an interval of 70 days between application and harvest of alfalfa seed used for food or feed. Postemergence applications require the addition of an adjuvant (nonionic surfactant, crop oil concentrate [COC], or methylated seed oil) and a nitrogen source.

Scepter 70DG (active ingredient imazaquin). A supplemental label has been granted to BASF for fall applications of Scepter before soybean planting. Fall applications of Scepter should be made after harvest and before ground freeze to provide residual control of winter annual and early emerging summer annual weeds. The use rate is 2.8 ounces per acre, and *do not* make more than one application per year.

Bayer CropScience

Option 35WDG (active ingredient foramsulfuron). Option is the only herbicide registered in 2002 that contains a new active ingredient. Option is a sulfonylurea herbicide and is labeled for postemergence use in field corn. Use rates range from 1.5 to 1.75 ounces per acre. Broadcast applications may be made when corn is between 0 to 16 inches in height or through the V5 growth stage, whichever is more restrictive. Drop nozzles must be used when corn is between 16 and 36 inches in height. Applications of Option must include a methylated seed oil and a nitrogen fertilizer. The use of nonionic surfactants or COCs results in unacceptable weed control. Do not make more than two applications or apply more than 3.5 ounces of Option per acre per year.

Option has good activity on several grass and broadleaf weed species. Grasses that Option controls include foxtails, fall panicum, barnyardgrass, shattercane, johnsongrass, quackgrass, and wirestem muhly. Some of the broadleaf weeds that Option controls are common lambsquarters, pigweeds, velvetleaf, common ragweed, and eastern black nightshade. Because Option is an ALS inhibitor, it does not provide satisfactory control of ALS-resistant weed biotypes. Tank mixtures with herbicides having other modes of action will be needed to control these species. Labeled tank-mix partners include atrazine, Beacon, dicamba, Distinct, Exceed, Harness, Hornet WDG, Marksman, NorthStar, Prowl, Spirit, Surpass, TopNotch, and Tough. Precautions that should be observed include certain corn hybrids that are sensitive to Option, so consult seed company hybrid sensitivity charts; do not apply Option in the same season if Counter, Dyfonate, or Thimet was used; do not make foliar applications of an organophosphate insecticide within 7 days of an Option application; replant intervals for Option are 7 days for corn, 14 days for soybean, and 60 days for all other crops; the preharvest interval for Option is 70 days for corn grain and 45 days for corn forage.

Dow AgroSciences LLC

Warrant 5.4L (active ingredient glyphosate). Registration of Warrant is expected the third quarter of 2003. Warrant is a higher load glyphosate formulation that contains a surfactant. Warrant is formulated as the isopropylamine salt of glyphosate that contains 5.4 pounds of active ingredient per gallon (4 pounds of acid equivalent per gallon). The 24-fluid-ounce rate of Warrant is equivalent to the 32-fluid-ounce rate of a glyphosate formulation with 4 pounds of active ingredient per gallon (3 pounds of acid equivalent per gallon; i.e., Glyphomax Plus).

Keystone 5.25SE (active ingredients acetochlor and atrazine). Keystone is a recently registered premixture containing 3.0 pounds of active ingredient of acetochlor (Surpass) and 2.25 pounds of active ingredient of atrazine. Keystone is formulated as a suspo-emulsion and is used for selective preemergence control of annual grasses, some annual broadleaf weeds, and sedges in field corn, production seed corn, silage corn, and popcorn. Keystone may be applied up to 30 days before planting (EPP), PPI, PRE, and EPOS to corn up to 11 inches in height. Application rates range from 2.2 to 3.4 quarts per acre depending on soil texture and soil organic matter content. A typical use rate of 2.65 quarts per acre of Keystone is equivalent to applying 2.5 pints of Surpass and 1.5 pounds of active ingredient of atrazine per acre.

Keystone LA 5.5SE (active ingredients acetochlor and atrazine). Similar to Keystone, Keystone LA is a premixture of acetochlor and atrazine. However, this formulation has “less atrazine,” designed for use in restricted or lower atrazine rate areas. Keystone LA contains 4.0 pounds of active ingredient per gallon of acetochlor and 1.5 pounds of active ingredient of atrazine. The typical use rates of Keystone LA range between 1.8 and 2.2 quarts per acre.

DuPont Agricultural Products

Cinch 7.64EC (active ingredient *S*-metolachlor), Cinch ATZ 5.5L (active ingredients *S*-metolachlor and atrazine), and *Cinch ATZ Lite 6L* (active ingredients *S*-metolachlor and atrazine) are new herbicides being marketed by DuPont Agricultural Products. The Cinch herbicides are equivalent formulations to Syngenta's Dual II Magnum, Bicep II Magnum, and Bicep Lite II Magnum. These products will replace the discontinued herbicide Leadoff.

Cimarron 60DF (active ingredient metsulfuron). Cimarron is registered for use in pastures, rangelands, and Conservation Reserve Program (CRP) acres. Cimarron is used at 0.1 to 1.0 ounce per acre to control broadleaf weeds. Apply Cimarron in the spring or early summer when weeds are less than 4 inches in height and are actively growing. Cimarron contains the same active ingredient as Ally, and the Cimarron label has many of the same precautionary statements as the Ally label.

Steadfast 75WDG (active ingredients nicosulfuron and rimsulfuron). The maximum corn height for Steadfast applications has been increased to 20-inch-tall corn or corn exhibiting six leaf collars (V6), whichever is more restrictive.

FMC Corporation

Aim EW 1.9EW (active ingredient carfentrazone). Aim EW is a liquid formulation that will replace the Aim 40DF dry formulation. The Aim EW use rate of 0.5 fluid ounce per acre is equivalent to the 0.33-ounce-per-acre rate of the dry formulation. Aim is labeled for field corn, seed corn, popcorn, corn silage, sweet corn, grain sorghum, soybean, wheat, barley, and oats.

Spartan 75WDG (active ingredient sulfentrazone). Spartan contains the same active ingredient as Authority for use in soybeans. However, Spartan may be applied up to 8 ounces per acre where Authority is only labeled to 5.3 ounces per acre. Spartan may be applied up to 45 days before planting through 3 days after soybean planting. Spartan should not be applied to emerged soybeans, or severe injury can occur. The higher rates of Spartan will extend control of morningglories, waterhemp, and hophornbeam copperleaf.

Monsanto Company

Roundup WeatherMax 5.5L (active ingredient glyphosate). Roundup WeatherMax will replace Roundup UltraMax 5L for broad-spectrum weed control in Roundup Ready crops and for nonselective weed control in many cropping systems, farmsteads, and CRP acres. Roundup WeatherMax is a higher-load glyphosate formulation that contains a surfactant. Roundup WeatherMax is formulated as the potassium salt of glyphosate that contains 5.5 pounds of active ingredient (4.5 pounds of acid equivalent per gallon). The 22-fluid-ounce rate of Roundup WeatherMax is equivalent to the 32-fluid-ounce rate of a glyphosate formulation with 4 pounds of active ingredient per gallon (3 pounds of acid equivalent per gallon; i.e., Roundup Ultra).

Yukon 67.5WDG (active ingredients halosulfuron and dicamba). Yukon is a premixture of 12.5% halosulfuron and 55% dicamba that was registered in 2002 for use in field corn, field corn grown for seed, and grain sorghum. The common use rate of Yukon is 4 ounces per acre, which delivers 2/3 ounce per acre of Permit and 4 fluid ounces per acre of Banvel. However, it can be applied up to 8 ounces per acre to control larger weed species in corn (6-ounce maximum rate for sorghum). Applications of Yukon must include either a nonionic surfactant or a COC, but not both. A nitrogen fertilizer (UAN or AMS) may be added to the spray solution; however, it is not required. Two applications of Yukon may be applied to corn per year with a total application not to exceed 8 ounces per acre. Yukon can be applied over-the-top or with drop nozzles from spike through 36-inch-tall field corn and from the 2-leaf stage to 15-inch-tall grain sorghum. Yukon controls both large- and small-seeded broadleaf weeds, with the added benefit of yellow nutsedge control. Because Yukon contains dicamba, special precautions need to be taken when applications are made near dicamba-sensitive species.

Syngenta Crop Protection, Inc.

Callisto 4SC (active ingredient mesotrione). The Callisto rotation restrictions for alfalfa, dry beans, snap bean, peas, sugar beets, and cucurbits have been changed to 18 months.

Lumax 3.95L (active ingredients *S*-metolachlor, mesotrione, and atrazine). Lumax is a recently registered premixture containing 2.68 pounds of active ingredient per gallon of *S*-metolachlor (Dual II Magnum), 0.268 pound of active ingredient per gallon of mesotrione (Callisto), and 1.0 pound of active ingredient per gallon of atrazine. Lumax is a selective preemergence herbicide that controls annual grasses, annual broadleaf weeds, and sedges in field, seed, and silage corn. Lumax may be applied up to 10 days before planting (EPP), PRE, and EPOS up to corn 5 inches in height. Application rates range from 2.5 to 3.0 quarts per acre depending on soil texture and soil organic matter content. A typical use rate of 3.0 quarts per acre of Lumax is equivalent to applying 2 pints of Dual II Magnum, 6.4 fluid ounces of Callisto, and 0.75 pound of active ingredient per acre of atrazine.

Valent

Gangster (active ingredients flumioxazin and cloransulam-methyl). Gangster is a multipack of Gangster V (flumioxazin, Valor) and Gangster FR (cloransulam-methyl, FirstRate) for use in soybeans. Gangster can be applied from 14 days prior to planting to 3 days after planting at rates ranging from 3.1 to 3.6 ounces per acre. Gangster should not be applied to emerged soybeans, or severe injury

(Continued on p. 12)

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will occur. Gangster will provide residual control of a number of broadleaf weeds.

Phoenix 2EC (active ingredient lactofen). Phoenix is a new formulation of lactofen, which is the active ingredient in Cobra. Phoenix contains 2 pounds per gallon of lactofen plus an adjuvant system. Use rates range from 8 to 12.5 fluid ounces per acre, and applications should include 0.125 to 0.25% (v/v) nonionic surfactant. A COC may be used at 1 pint per acre if weeds are under stress due to hot and dry conditions. The addition of a COC causes soybean leaf burn similar to Cobra. Phoenix with a nonionic surfactant also causes some leaf bronzing or speckling; however, it may not be to the same extent as Cobra. The rainfastness of Phoenix is 2 hours compared with Cobra's 1/2 hour.—*Christy Sprague and Aaron Hager*

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